

III. REMARKS

As an initial matter, the Examiner has not considered the International Search Report (ISR) issued in corresponding application No. PCT/EP2004/009424, which filed with the Information Disclosure Statement (IDS) of March 6, 2006. Applicant notes that an English Translation of the “Written Opinion of the International Searching Authority (ISA)” of PCT/EP2004/009424 has been filed with the United States Patent and Trademark Office (USPTO) on April 9, 2007. Applicant respectfully requests that the Examiner consider the ISR in view of the Written Opinion of ISA.

The drawing filed on March 6, 2006 stands objected to under 37 C.F.R. 1.83 (b) because “it is incomplete.” Applicant respectfully traverses the Examiner’s objection regarding the drawing. Specifically, the present application has only one drawing, i.e. Figure 1, which has been previously completed in the replacement sheet of the drawing submitted to USPTO along with Preliminary Amendment (A) on March 6, 2006. Furthermore, the Examiner has not stated a single reason to explain why, in his opinion, the drawing is incomplete, but rather stated general rules with respect to objection to drawings. For all of these reasons, Applicant respectfully requests that the Examiner withdraw the objection to the drawing (Figure 1) and accept Figure 1 for further examination.

A substitute specification in compliance with 37 C.F.R. 1.125 is attached to incorporate a correct translation for the term “formschlüssig” from German to English. Because the term “formschlüssig” in German was originally disclosed in International Application PCT/EP2004/009424, written in German, corresponding to the present application (See Exhibit 1, attached International Application PCT/EP2004/009424, published as WO 2005/028834 A1 on March 31, 2005 in which the term “formschlüssig” is underlined), and the entire disclosure of International Application PCT/EP2004/009424 is incorporated by reference in the present application, Applicant is entitled to incorporate a correct English translation for the term

“formschlüssig” into the present application. The attached substitute specification contains no new matter.

Specifically, the substitute specification filed along with Preliminary Amendment (A) dated in March 6, 2006 (page 3, line 8, page 5, lines 15 and 18, page 6, line 3, and page 9, line 3) has been amended to delete “positive engagement,” the incorrect English definition of “formschlüssig” in German, and to include “interlocking,” the correct English definition of “formschlüssig” in German, as supported in http://www.proz.com/kudoz/german_to_english/engineering_general/18392-formschl%C3%BCssig_kraftschl%C3%BCssig_evoh_verbindungstechnik.html (See Exhibit 2, a copy of the foregoing website).

With the present amendment above, claims 1 and 8 have been amended. In addition, claims 9 and 10 have been cancelled and new independent claims 17 and 18 have been added.

Specifically, claim 1 has been amended to recite “the adjusting device is arranged in a housing..., whereby electrical conductor tracks are arranged..., wherein a connection between the electrical conductor tracks and the connecting contacts of the electric motor is a frictional connection” as supported on page 5, line 22 to page 6, line 1 of Applicant’s specification as originally filed. Claims 1 and 8 have been also amended to replace “positive engagement” with “interlocking” as supported in the definition as described in the same website above (See Exhibit 2).

New independent claim 17 incorporates subject matter from previous claims 1, 2, 8 and 9, and corresponds to previous claim 9 rewritten in independent form. Therefore, new independent claim 17 has a same scope as previous claim 9. New independent claim 18 incorporates subject matter from previous claims 1 and 10, and corresponds to previous claim 10 rewritten in independent form. Therefore, new independent claim 17 has a same scope as previous claim 9.

No new matter has been added by the present amendment.

A. The Invention

The present invention relates to an adjusting device, in particular a valve adjusting device of a combustion engine, with an electric motor and gear unit.

In accordance with an embodiment of the present invention, an adjusting device for a valve is provided that includes elements recited in independent claims 1, 17 and 18.

Various other embodiments, in accordance with the present invention, are recited in dependent claims 2-8 and 11-16.

An advantage provided by various embodiments of the present invention is that an adjusting device for a valve can be provided in which a structurally identical housing may be used for various customer requirements with respect to the use of different motors, connection contacts, and position detecting devices, which avoids, if electronic malfunctions occur, a replacement of complete circuit boards or housing components.

B. The Rejections

Claim 1-16 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Schaefer et al. (U.S Patent No. 5,672,818, hereafter “Schaefer’818”) in view of Zdanys, Jr. et al. (U.S Patent No. 5,684,407, hereafter “Zdanys’407”).

Applicant respectfully traverses the Examiner’s rejections and request reconsideration of the above-captioned application for the following reasons.

C. Applicant’s Arguments

A prima facie case of obviousness requires a showing that the scope and content of the prior art teaches each and every element of the claimed invention, and that the prior art

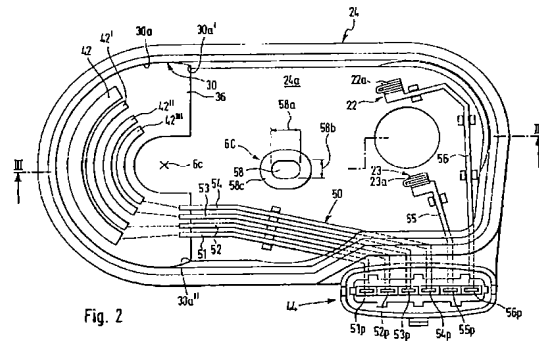
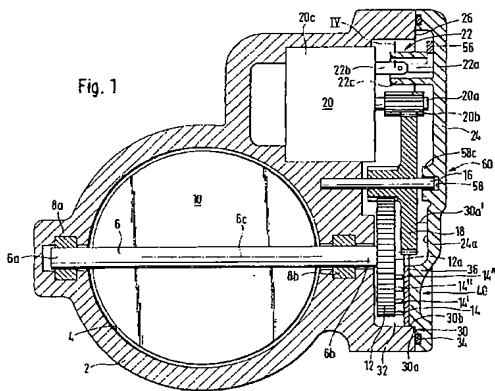
provides some teaching, suggestion or motivation, or other legitimate reason, for combining the references in the manner claimed. KSR International Co. v. Teleflex Inc., 127 S.Ct. 1727, 11739-41 (2007); In re Oetiker, 24 U.S. P.G.2d 1443 (Fed. Cir. 1992).

In this case, the Examiner has failed to establish a prima facie case of obviousness against claims 1-8 and 11-18 because Schaefer'818 in view of Zdanys'407 fails to teach all of the limitations of the claims.

Furthermore, (1) the Examiner has failed to establish a legitimate reason to combine Schaefer'818 and Zdanys'407 to arrive Applicant's claimed invention and (2) the Examiner has failed to demonstrate that a person of ordinary skill in the art would have had a reasonable expectation of success of arriving at the claimed invention even if the combination were made. Thus, the rejections under §103 should be reconsidered and withdrawn.

i. Schaefer'818

Schaefer'818 relates to a throttle valve adjusting unit (Schaefer'818, column 1, lines 4-5). The valve adjusting unit as described in Schaefer'818 (Figs. 1 and 2 (see below), and column 3, line 19-column 4, line 58) comprises a electronic control motor (20), sheet-metal stamped parts (50-56), electrical motor couplings (22, 23) having motor plug contacts (22a, 23a) and motor counterpart plug contacts (22b, 23b), respectively, and a potentiometer (40) formed by potentiometer paths (42-42''').



As admitted by the Examiner (Office Action dated February 13, 2009, p. 3, lines 18-19), Schaefer'818 does not teach, or suggest, (i) "whereby the conductor tracks are replaceable with the plug" as recited in independent claim 1, and new independent claims 17 and 18.

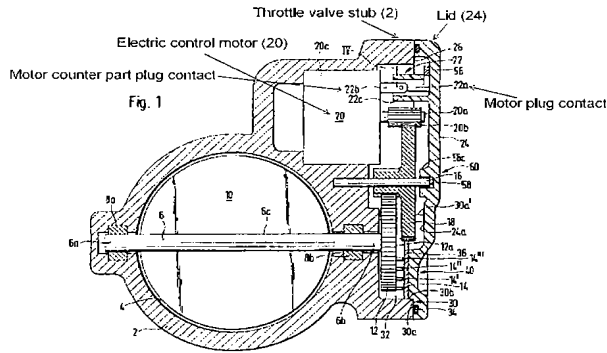
However, this is not the only deficiency in the disclosure of Schaefer'818, Schaefer'818 also does not teach, or suggest, (ii) "wherein the adjusting device is arranged in a housing that can be closed via a cover," (iii) "wherein a connection between the electrical conductor tracks and the connecting contacts of the electric motor is a frictional connection," and (iv) "wherein the electrical conductor tracks include first conductor tracks and second conductor tracks comprising metal stampings that are connectable to the housing with interlocking, and these stampings have a defined shape" as recited in claims 1, 17 and 18.

In addition, Schaefer'818 does not teach, or suggest, (v) "wherein the electrical conductor tracks further comprise a perforation comb, and individual conductor tracks are connected via bridges, wherein each connection can be severed through a stamping process after the perforation comb has been placed in the housing" as recited in claims 2 and 17, (vi) "wherein respective first ends of the electrical conductor tracks lead to the plug in which the electrical conductor tracks lock with stamped-out locking projections or are coated with sprayed plastic" as recited in claims 3 and 12, (vii) "wherein respective first ends of the electrical conductor tracks lead to the plug and an electrical contact to pins of the plug is

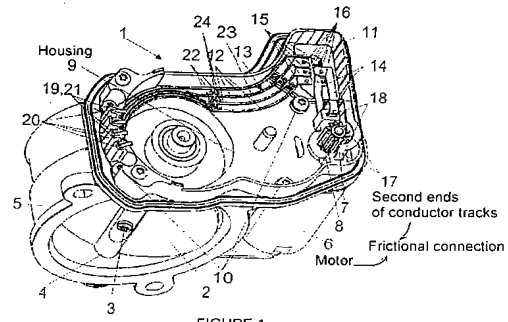
provided via a press connection” as recited in claims 4 and 13, (viii) “wherein respective second ends of the first conductor tracks providing contact to the motor are plugged into receptacle pockets of the housing, where the respective second ends provide a frictional connection to connecting lugs of the electric motor” as recited in claim 5, (ix) “wherein respective second ends of the second conductor tracks provide contact to the position detecting device and are shaped so that a connection to the connection contacts of the position detecting device is provided by bracing the second ends of the second conductor tracks against a structural component of the position detecting device” as recited in claim 6, (x) “wherein the position detecting device is a potentiometer, and the respective second ends of the second conductor tracks providing contact to the potentiometer are shaped so that a connection to arm tracks of the potentiometer is produced by bracing end pieces of the second ends of the second conductor tracks against a potentiometer circuit board” as recited in claim 7, (xi) “wherein the electrical conductor tracks are fixed to the housing with interlocking in the area of respective ends of the electrical conductor tracks and corresponding bridges” as recited in claims 8 and 17, (xii) “wherein a sealing adhesive is applied at at least one position of the electrical conductor tracks” as recited in claims 11 and 14, (xiii) “wherein a sealing adhesive is applied at at least one position of in the area of the connection between the pins of the plug and the electrical conductor tracks” as recited in claims 11 and 15, (xiv) “wherein a sealing adhesive is applied at at least one position of the electrical conductor tracks and in the area of the connection between the pins of the plug and the electrical conductor tracks” as recited in claims 11 and 16, (xv) “wherein bridges of the perforation combs engage in recesses on the housing so as to provide interlocking connection” as recited in claim 17, and (xvi) “wherein the interlocking connection takes place through hot caulking of projections of the housing on the electrical conductor tracks” as recited in claim 18.

First, the Examiner argues that a “housing” is defined by “anything that covers or protects” (Office Action dated February 13, 2009, p. 4, lines 1-2). However, Applicant neither accepts nor is obligated to adopt the Examiner’s definition of the term “housing.” According to page 650 from the Random House Webster’s College Dictionary (1991), “housing” is defined to include “to be a receptacle or repository for; hold; contain....” Applicant respectfully files this definition of “housing” on page 650 from the Random House Webster’s College Dictionary (1991) as a definition of “housing” with this amendment (See Exhibit 3, a copy of page 650 from the Random House Webster’s College Dictionary (1991)).

As described above, Schaefer’818 discloses electrical motor couplings (22, 23) having motor plug contacts (22a, 23a) and motor counterpart plug contacts (22b, 23b), respectively. The motor plug contacts 22a and 23a extend from a lid (24), and are secured to the lid. The motor counterpart plug contacts (22b, 23b) protrude on the face end from a housing of a control motor (20) in a throttle valve stub (2). Therefore, an electrical connection of the motor to sheet-metal stamped parts (55, 56), i.e., electrical conductor tracks alleged by the Examiner (Office Action dated February 13, 2009, p. 3, lines 7-11) is formed only when the lid (24) is put on the throttle valve stub (2). Schaefer’818, Fig. 1 (see below), column 2, lines 16-19, column 3, lines 19-28, and column 4, line 58 to column 5, line 16. On the other hand, in the present invention, “a connection between electrical conductor tracks (14) and connecting contacts of an electric motor (6) in a housing (9) is a frictional connection,” and thus the connection can be achieved without closing the housing (9) with a cover (Figure 1 (see below), p. 5, line 22 to p. 6, line 1 of Applicant’s specification as originally filed).



Schaefer'818



Applicant's Disclosure

The Examiner has interpreted the phrase “positively engaged,” as disclosed in the English translation of Applicant’s disclosure as originally filed, as “securely connected or otherwise fastened to” (Office Action dated February 13, 2009, p. 4, lines 2-4).

However, the phrase “positive engagement,” as presented in the English translation of Applicant’s disclosure as originally filed, is an incorrect English definition of the term “formschlüssig” in German, and thus does not clearly define how electrical conductor tracks (12, 14) are held in a housing (9) of a valve adjusting device in the present invention. Applicant respectfully files a term “interlocking” as a correct English definition of the term “formschlüssig” in German, as supported in Exhibit 2, instead of the phrase “positive engagement.” The meaning of the term “interlocking” in the present application as amended, is that the electrical conductor tracks (12, 14) embodied as a perforation comb (13) are held in the housing (9) by the shape of the housing. As a result, no additional fastening is required for the “interlocking.” The opposite term of the “formschlüssig” is the term “kraftschlüssig” which may be interpreted as, for example, “force-fit” (See Exhibit 2). The term “force-fit” means fastening by means of screw or welding, contrary to “interlocking.”

In contrast, sheet-metal stamped parts (50-56) of Schaefer’818, i.e., electrical conductor tracks alleged by the Examiner, are not held in the lid (24) by the shape of the lid

(with “interlocking”) as described in claim 1 as amended of the present application. The sheet-metal stamped parts (50-56) of Schaefer’818 are rather cast onto the lid (24) or part-way into the lid (24) (Schaefer’818, column 4, lines 24-31).

Furthermore, Applicant notes that potentiometer paths (42-42’’) of Schaefer’818 (column 4, lines 50-58), connection contacts alleged by the Examiner, broadly pertains to electrical conductor parts because the potentiometer paths (42-42’’) are electrically connected to the end of sheet metal stamped parts (50-56) which is alleged to electrical conductor tracks by the Examiner (Office Action dated February 13, 2009, p. 3, lines 7-11). As described on column 3, lines 50-54 of Schaefer’818, a carrier material (36) for the potentiometer path (42) is applied and glued to the inside the lid (24). On the other hand, electrical conductor tracks (12, 14) of the present invention need neither a carrier material nor a glue to fasten them to the housing (9) because they are held in the housing with “interlocking.”

For all of the above reasons, Schaefer’818 does not render obvious the subject matter of claims 1-8 and 11-18 of the above-captioned application.

ii. Zdanys’407

Zdanys’407 relates to position sensors having an electronic circuit, which may be used for mechanically variable resistors (Zdanys’407, column 1, lines 7-9). The electronic circuit as described on column 4, lines 31-60 of Zdanys’407, includes an electrical connector formed by a leadframe (73) which has three terminals (70-72) crimped and attached to a printed circuit board (78) and then soldered thereto (Zdanys’407, Figs. 6 and 7 (see below), and column 4, lines 31-60).

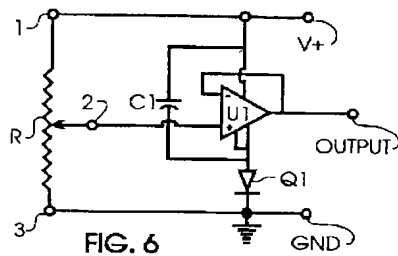


FIG. 6

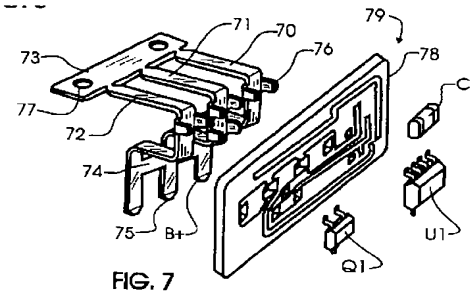


FIG. 7

Zdanys'407 does not teach, or suggest, (i) "An adjusting device for a valve drive of a combustion engine, comprising: an electric motor;" (ii) "a gear unit connected to the electric motor, wherein the adjusting device is arranged in a housing that can be closed via a cover, whereby electrical conductor tracks are arranged in the housing to connect connection contacts of the electric motor and a position detecting device to a plug of the adjusting device, wherein a connection between the electrical conductor tracks and the connecting contacts of the electric motor is a frictional connection," (iii) "wherein the electrical conductor tracks include first conductor tracks and second conductor tracks comprising metal stampings that are connectable to the housing with interlocking, these stampings have a defined shape," and (iv) "whereby the conductor tracks are replaceable with the plug" as recited in claims 1, 17 and 18.

In addition, Zdanys'407 does not teach, or suggest, (v) "wherein the electrical conductor tracks further comprise a perforation comb, and individual conductor tracks are connected via bridges, wherein each connection can be severed through a stamping process after the perforation comb has been placed in the housing" as recited in claims 2 and 17, (vi) "wherein respective first ends of the electrical conductor tracks lead to the plug in which the electrical conductor tracks lock with stamped-out locking projections or are coated with sprayed plastic" as recited in claims 3 and 12, (vii) "wherein respective first ends of the electrical conductor tracks lead to the plug and an electrical contact to pins of the plug is

provided via a press connection” as recited in claims 4 and 13, (viii) “wherein respective second ends of the first conductor tracks providing contact to the motor are plugged into receptacle pockets of the housing, where the respective second ends provide a frictional connection to connecting lugs of the electric motor” as recited in claim 5, (ix) “wherein respective second ends of the second conductor tracks provide contact to the position detecting device and are shaped so that a connection to the connection contacts of the position detecting device is provided by bracing the second ends of the second conductor tracks against a structural component of the position detecting device” as recited in claim 6, (x) “wherein the position detecting device is a potentiometer, and the respective second ends of the second conductor tracks providing contact to the potentiometer are shaped so that a connection to arm tracks of the potentiometer is produced by bracing end pieces of the second ends of the second conductor tracks against a potentiometer circuit board” as recited in claim 7, (xi) “wherein the electrical conductor tracks are fixed to the housing with interlocking in the area of respective ends of the electrical conductor tracks and corresponding bridges” as recited in claims 8 and 17, (xii) “wherein a sealing adhesive is applied at at least one position of the electrical conductor tracks” as recited in claims 11 and 14, (xiii) “wherein a sealing adhesive is applied at at least one position of in the area of the connection between the pins of the plug and the electrical conductor tracks” as recited in claims 11 and 15, (xiv) “wherein a sealing adhesive is applied at at least one position of the electrical conductor tracks and in the area of the connection between the pins of the plug and the electrical conductor tracks” as recited in claims 11 and 16, (xv) “wherein bridges of the perforation combs engage in recesses on the housing so as to provide interlocking connection” as recited in claim 17, and (xvi) “wherein the interlocking connection takes place through hot caulking of projections of the housing on the electrical conductor tracks” as recited in claim 18.

The Examiner contends that the connectors of Zdanys'407 are crimped to the printed circuit board (78) and then soldered thereto, the connectors provide for a connector that is also replaceable with the plug because the connection can be unsoldered, opened and then removed (Office Action dated February 13, 2009, p. 4, lines 4-6). However, the printed circuit board (78) of Zdanys'407 does not have electrical conductor tracks and a plug having such features as described in claim 1 as amended of the present application, wherein the plug can be replaceable with the electrical conductor tracks.

For all of the above reasons, Zdanys'407 does not render obvious the subject matter of claims 1-8 and 11-18 of the above-captioned application.

iii. The Examiner's Official Notices

The Examiner takes "Official Notice" that "hot caulking or hot gluing of components for the purpose of attaching them together is well known, as are the advantages and disadvantages of such processes, and the use of hot caulking or gluing, in order to attach a supporting means for a conductor to a housing would require only routine skill in the art" (Office Action dated February 13, 2009, p. 6 line 9 to p. 7, line 2), and that "sealing adhesives, including their uses, advantages and disadvantages, are well known, and one of ordinary skill in the art at the time the invention was made would be reasonably expected to apply said sealing adhesives to any location where sealing and adhesion are desired, including at at least one position of: (i) the electrical conductor tracks, (ii) in the area of the connection between the pins of the plug and the electrical conductor tracks, or (iii) the electrical conductor tracks and in the area of the connection between the pins of the plug and the electrical conductor tracks" (Office Action dated February 13, 2009, p. 7, lines 3-12).

Applicant wishes to point out that the Administrative Procedure Act requires that the Examiner's rejections employ "reasoned decision making" based on evidence from a fully

developed administrative record. In re Lee, 61 U.S.P.Q.2d 1430, 1433 (Fed. Cir. 2002). Patentability determinations that are based on what the Examiner believes is “basic knowledge” and “common sense,” and that otherwise lacks substantial evidentiary support, are impermissible. In re Zurko, 59 U.S.P.Q.2d 1693, 1697 (Fed. Cir. 2001). Therefore, Applicant respectfully traverses the Examiner’s Section 103 rejection of claims 10 which corresponds to new claim 18 as added, and claims 11 and 14-16, on the grounds that the “Office Notices” are unsubstantiated and improper. The Examiner must now provide substantial evidentiary support (e.g., produce a prior art reference) with respect to notices, or withdraw the Section 103 rejection standing against claim 10 which corresponds to new claim 18 as added, and claims 11 and 14-16.

iv. Summary of the Disclosures

Neither Schaefer’818 nor Zdanys’407 teach, or suggest, either alone or in combination, (i) “wherein the adjusting device is arranged in a housing that can be closed via a cover,” (ii) “wherein a connection between the electrical conductor tracks and the connecting contacts of the electric motor is a frictional connection,” (iii) “wherein the electrical conductor tracks include first conductor tracks and second conductor tracks comprising metal stampings that are connectable to the housing with interlocking, and these stampings have a defined shape,” and (iv) “whereby the conductor tracks are replaceable with the plug” as recited in independent claims 1, 17 and 18, (v) “wherein the electrical conductor tracks further comprise a perforation comb, and individual conductor tracks are connected via bridges, wherein each connection can be severed through a stamping process after the perforation comb has been placed in the housing,” (vi) “wherein the electrical conductor tracks are fixed to the housing with interlocking in the area of respective ends of the electrical conductor tracks and corresponding bridges,” and (vii) “wherein bridges of the perforation

combs engage in recesses on the housing so as to provide interlocking connection” as recited in independent claim 17, and (viii) “wherein the interlocking connection takes place through hot caulking of projections of the housing on the electrical conductor tracks” as recited in independent claim 18.

Furthermore, neither Schaefer’818 nor Zdanys’407 teach, or suggest, either alone or in combination, the limitation of dependent claims 2-8 and 11-16.

For all of the above reasons, the Examiner has failed to establish a prima facie case of obviousness against claims 1-8 and 11-18 of the above-captioned application.

iv. No Legitimate Reason to Combine Schaefer’818 with Zdanys’407, and No reasonable Expectation of Success Even if the Combination Were Made

A proper rejection under Section 103 requires showing (1) that a person of ordinary skill in the art would have had a legitimate reason to attempt to make the composition or device, or to carry out the claimed process, and (2) that the person of ordinary skill in the art would have had a reasonable expectation of success in doing so. PharmaStem Therapeutics, Inc. v. ViaCell, Inc., 491 F.3d 1342, 1360 (Fed. Cir. 2007). In this case, the Examiner has failed to demonstrate that a person of ordinary skill in the art would have had a legitimate reason to combine Schaefer’818 with Zdanys’407, and a reasonable expectation of success of arriving at Applicant’s claimed invention even if the combination of Schaefer’818 with Zdanys’407 were made.

An object of the present invention is to obtain a valve adjusting device in which a contacting between an electric motor or a position detecting device and a plug is embodied such that it is possible to replace or add only electrical conductor tracks with the plug component but without a replacement of complete circuit boards or housing components (Applicant’s specification as originally filed, p. 2. lines 7-21). In order to achieve this object, the electrical

conductor tracks connecting the electrical motor and the position detecting device to the plug are connectable to the housing with “interlocking” (claim 1 as amended of the present application).

Schaefer’818 has sheet-metal stamped parts (50-56), electrical conductor tracks alleged by the Examiner, cast onto a lid (24) or part-way into the lid, and an electric plug connection for a throttle control valve to an electric contact unit, formed onto the lid (Schaefer’818, column 4, lines 15-58). Accordingly, if electronic malfunctions occur in Schaefer’818, the entire lid with the sheet-metal stamped parts and the electric plug should to be replaced, contrary to the present invention. Furthermore, Zdanys’407, as discussed above, neither has electrical conductor tracks and a plug which are arranged in such manner as described in claim 1 as amended of the present application, nor electrical conductor tracks which are connectable to a housing with “interlocking.”

Therefore, a person of ordinary skill in the art would have no reason to combine the references to arrive the Applicant’s claimed invention. Even if the combination were made, a person of ordinary skill in the art would not have had a reasonable expectation of success of arriving at the Applicant’s claimed invention, because, for example, there is no teaching, suggestion or other reason cited by the Examiner so that an “interlocking” connection can results between a housing and electrical conductor tracks, thereby the electrical conductor tracks are replaceable with a plug, as recited in independent claims 1, 17 and 18.

For all of the above reasons, the Examiner has failed to establish a prima facie case of obviousness against claims 1-8 and 11-18 of the Applicant’s claimed invention.

III. CONCLUSION

The Examiner has failed to establish a prima facie case of obviousness under 35 U.S.C. § 103(a) based on Schaefer’818 in view of Zdanys’407 because:

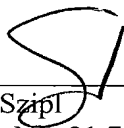
- (i) neither Schaefer'818 nor Zdanys'407, either alone or in combination, teach all the limitations of claims 1-8 and 11-18;
- (ii) the Examiner has not substantiated the Official Notices;
- (iii) the Examiner has failed to establish a legitimate reason to make the combination; and
- (iv) the Examiner has failed to demonstrate that a person of ordinary skill in the art would have had a reasonable expectation of success in arriving at Applicant's claimed invention even if the improper combination was made.

For all of the above reasons, claims 1-8 and 11-18 are in condition for allowance, and a prompt notice of allowance is earnestly solicited.

The below-signed attorney for Applicant welcomes any questions.

Respectfully submitted,

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ADJUSTING DEVICE ESPECIALLY FOR A THROTTLE VALVE OF AN INTERNAL COMBUSTION ENGINE

[0001] This is a National Phase Application in the United States of International Patent Application No. PCT/EP2004/009424 filed August 24, 2004, which claims priority on German Patent Application No. DE 103 41 394.4, filed September 5, 2003. The entire disclosures of the above patent applications are hereby incorporated by reference.

FIELD OF THE INVENTION

[0002] The invention relates to an adjusting device, in particular, a valve adjusting device of a combustion engine with an electric motor and a gear unit, which device is arranged in a housing that can be closed via a cover, whereby electrical conductor tracks are arranged in the housing to connect the connection contacts of the electric motor and a position detecting device to a plug of the adjusting device.

BACKGROUND OF THE INVENTION

[0003] Adjusting devices in which a valve shaft with valves of an electric motor permanently arranged thereon are caused to rotate indirectly via a gear unit, are generally known, and are described in a number of patent applications. The electrical contacting between the connection contacts of the electric motor or of a position detecting device to a corresponding plug, whose embodiment varies according to the customer, is thereby realized in different ways.

[0004] While in the past movable cables were frequently soldered to the contact points, it has recently become the practice to realize the contacts via conductor tracks printed on a circuit board. Embodiments are also known in which the conductor tracks are printed directly onto a contact plate of a housing or of a cover of the adjusting device. Embodiments are likewise known in which the metallic conductor tracks are injected directly into the plastic or plastic is sprayed around the conductor tracks. From more recent use applications it is also known to make the conductor tracks from an electrically conductive plastic and to spray this plastic onto the circuit board or the housing, whereby this embodiment has the disadvantage that the contacting is not sufficiently reliable, in particular under a fairly high mechanical load, since the sprayed-on conductor tracks break.

[0005] However, all these forms of embodiment have the disadvantage that the complete boards or even housing components must be newly designed and manufactured for each new customer requirement with respect to the contacting, for example depending on how many connection contacts are necessary or what kind of position detecting device is used. The manufacturing must also be changed accordingly. The only exception is the freely movable cables that were used in earlier times, whereby such a connection is extremely difficult to carry out in today's limited installation space and results in increased production costs and assembly costs due to the individual solderings.

[0006] It is therefore the object of the invention to make available an adjusting device in which a structurally identical housing can be used for various customer requirements with

respect to the use of different motors, connection contacts, and position detecting devices. Accordingly, if electronic malfunctions occur, a replacement of complete circuit boards or housing components is also to be avoided.

SUMMARY OF THE INVENTION

[0007] This object is achieved in that the electrical conductor tracks are embodied as metal stampings that can be connected to the housing with ~~interlocking~~positive engagement, which stampings feature a defined shape, whereby the conductor tracks with the plug can be replaced. The contacting between the electric motor or the position detecting device and the plug is embodied such that it is possible to replace or add only the conductor tracks with the plug component but without additional housing components. The basic structural shapes of the housing on or to which the conductor tracks are fixed, can also be retained for different necessary contactings and plug embodiments based on different customer wishes, for example different position detecting devices, without having to change the shapes and thus the tools for the production of the housing. Thus, a high flexibility arises in the connection of the electrical attachments.

[0008] In a preferred form of embodiment, the conductor tracks are embodied as a perforation comb, whereby the individual conductor tracks are connected via bridges, which connection can be severed through a stamping process after the perforation comb has been placed in the housing. This has the advantage that the entire electrical connection can be replaced as one component and thus is simple to produce and above all to mount. The housing component into which the perforation comb is placed is embodied thereby such that corresponding recesses

are arranged in the area of the bridges, in which recesses a tool can engage in order to sever the individual conductor tracks.

[0009] In another preferred form of embodiment, the respective first ends of the conductor tracks lead to the plug, in which they lock with stamped-out locking projections or are coated with sprayed plastic. Thus a reliable contacting is formed in a simple manner and simultaneously the plug component arranged in the housing is sealed against the outside atmosphere, whereby the plug can be embodied in one piece with the housing as well as able to be separated from one another, i.e. in two pieces.

[0010] In an alternative form of embodiment, the respective first ends of the conductor tracks lead to the plug, where an electrical contact to pins of the plug can be produced via a press connection. Thus the plug component can be manufactured individually and only be connected to the conductor tracks via this press connection in a subsequent assembly step.

[0011] It is likewise advantageous if the respective second ends of the conductor tracks producing the contact to the motor are plugged into receptacle pockets of the housing, where they produce a frictional connection to connecting lugs of the electric motor. By these means the necessary connection can be produced during the assembly by simply plugging-in the electric motor and the conductor track without additional production- or assembly steps, as a result of which assembly costs are reduced.

[0012] Moreover, the respective second ends of the conductor tracks producing the contact to the position detecting device are advantageously shaped in such a way that a connection to the connection contacts of the position detecting device can be produced by bracing the second ends of the conductor tracks against a structural component of the position detecting device.

[0013] In a particular embodiment, the position detecting device can be a potentiometer, whereby the respective second ends of the conductor tracks producing the contact to the potentiometer are shaped in such a way that a connection to the arm tracks of the potentiometer can be produced by bracing the end pieces of the second ends of the conductor tracks against a potentiometer circuit board. The potentiometer circuit board can thereby be embodied either in one piece with the housing cover or in the housing itself or can be connected to the housing as an individual structural component. In all cases, a simple contacting results without additional assembly steps.

[0014] In another preferred form of embodiment, the conductor tracks are fixed to the housing with interlocking~~positive-engagement~~ in the area of their respective ends and their bridges so that an axial displacement of the conductor tracks is prevented.

[0015] In a further form of embodiment, the bridges of the perforation combs engage in recesses on the housing in such a way that the interlocking~~positive-engagement~~ connection is produced. By these means both the severing of the individual conductor tracks from one

another, and their fixing to the housing, can take place in only one operational step so that assembly steps can be saved.

[0016] In an alternative embodiment, the ~~interlocking~~positive-engagement connection takes place through the hot caulking of projections of the contact plate on the conductor tracks.

[0017] In a further alternative form of embodiment, a sealing adhesive is applied at at least one position of the conductor tracks and/or in the area of the connection between the pins of the plug and the conductor tracks, by which means the fixing of the conductor tracks on the plug or on the housing is again realized in a simple manner.

[0018] An adjusting device is thus created with which the contacting is reliably ensured in a housing of an adjusting device, and a high flexibility is thereby achieved with respect to the number or the position of the conductor tracks as well as with respect to the connection to a customer-requested plug. By these means the number of identical structural components of the adjusting device can be increased so that further costs can be saved. A replacement of the electrical contacting is possible, without having to replace other parts at the same time.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] An adjusting device according to the invention is shown in the drawing and is described below.

DETAILED DESCRIPTION OF THE INVENTION

[0020] The Figure shows, in a three-dimensional representation, an opened housing of an adjusting device according to the invention, using a throttle valve adjusting device as an example.

[0021] The adjusting device 1 shown in the Figure is used here by way of example for the adjustment of a throttle valve 2 that is fixed on a shaft 4 via screws 3 and that is arranged in a throttle valve housing 5. The adjusting device 1 comprises an electric motor 6 on whose motor shaft 7 a gear wheel 8 is arranged that drives the throttle valve shaft 4 via a further reduction gear, not shown. The gear, the electrical contacting, and if applicable the electric motor, are arranged in a housing 9 that is fixed to the throttle valve housing 5 via screws 10 and is closed by means of a cover, not shown.

[0022] The electrical contacting of a plug 11 to a position detecting device, not shown in greater detail, takes place via stamped conductor tracks 12, which can be introduced into the housing 9 adhering as a perforation comb 13. The contacting of the plug 11 to the connecting lugs, not shown, of the electric motor 6 takes place via further stamped conductor tracks 14.

[0023] Respective first ends 15 of the conductor tracks 12, 14 are connected via a press connection to pins 16 of the plug 11 that exit from the housing 9 on the opposite side of the housing 9. For the additional reliability and sealing of this connection, a sealing adhesive can be applied in the area of the plug 11. It would also be conceivable to embody the conductor tracks 12, 14 so that their first ends 15 are respectively bent by 90 degrees and pass through the housing

via locking projections and thus simultaneously serve as pins 16 of the plug 11, whereby in such an embodiment a sealing between the housing 9 and the pins 16 or first ends 15 of the conductor tracks 12, 14, would have to be guaranteed.

[0024] Second ends 17 of the conductor tracks 14 for the contacting of the electric motor 6 are finally shaped so that they point in the axial direction and there engage in receptacle pockets 18, where a frictional connection to connection contacts, not shown, of the electric motor 6 is produced by pushing the ends 17 into the receptacle pockets 18. This is guaranteed in that the second ends 17 lie in a springy manner adjacent to one side of the receptacle pockets 18, on which the motor connection contacts also lie, so that the contact to the connecting lugs of the motor 6 by frictional connection is ensured. The second ends 19 shown, of the conductor tracks 12, are embodied for the contacting of arm tracks, not shown, of a potentiometer, not shown, in such a way that the conductor tracks 12 otherwise running transverse to the axial direction are first bent in this area 19 by 90 degrees, whereby this part is arranged in receptacle pockets 20, and then are bent again by an angle smaller than 90 degrees. These end pieces 21 extend from the receptacle pockets 20 in such a way that these end pieces 21 can be deformed in the axial direction. During the subsequent mounting of a potentiometer circuit board with arm tracks arranged thereon, which is not shown, the board is pressed onto the end pieces 21 so that the pieces can be bent in a springy manner in the direction of the throttle valve, so that a frictional connection is produced to the arm tracks of the potentiometer.

[0025] As mentioned, the conductor tracks 12 are embodied as a perforation comb 13, whereby bridges 22 are arranged between the individual conductor tracks. If necessary, these

bridges 22 can be used to fix the center sections 23 of the conductor tracks 12, in that when the bridges 22 are severed, they can be bent until they engage in corresponding recesses 24 of the housing 9, so that an ~~interlocking~~ positive engagement connection results between the housing 9 and the conductor tracks 12. This takes place, in particular, when the fixing by means of the connection to the plug, or by means of the acceptance of the conductor track ends 19 in the receptacle pockets 20, is not sufficient for the axial fixing of the conductor tracks 12 essentially running transverse to the axial direction.

[0026] An alternative possible method for fixing the center sections 23 of the conductor tracks 12, 14 can take place in that projections, not shown, embodied on the housing 9 by means of hot caulking are pressed onto the conductor tracks 12, 14. Adhering with the aid of a sealing adhesive is also conceivable within the scope of the present invention.

[0027] This form of embodiment shows that the contact via conductor tracks that essentially lie exposed in the housing can take place in a simple manner, whereby assembly steps are saved by means of the frictional connections, but the conductor tracks are nonetheless fixed in the housing and can be replaced independently of the housing. In comparison with known embodiments, the assembly cost does not increase, since all the conductor tracks are embodied jointly as a perforation comb and can be introduced into the housing.